

## CLAIMS

*Sub 1*

1. A method of performing a one-pot organic reaction, which includes carbon monoxide as reactant and does not use of an external CO gas source, which comprises preparing a reaction mixture containing a non-catalysing solid or liquid CO releasing compound, a non-metal substrate compound and a metal catalyst; and exposing said reaction mixture to an energy source to release carbon monoxide from the CO releasing compound, wherein carbon atoms of the released carbon monoxide form a bond with the non-metal substrate compound.

2. The method according to claim 1, wherein the non-catalysing CO releasing compound is a metal carbonyl of the general formula I,



wherein M is a metal, x is an integer, y is an integer; and wherein the metal carbonyl is not complexed with or bonded to the non-metal substrate prior to preparing said reaction mixture.

3. The method according to claim 1, wherein the non-catalysing CO releasing compound is a formamide of the general formula II,



wherein R<sub>1</sub> and R<sub>2</sub> independently can be H, or an optionally substituted, linear or branched alkyl, aryl or alkylaryl group.

4. The method according to claim 3, wherein R<sub>1</sub> and R<sub>2</sub> independently are a C<sub>1-6</sub> alkyl group or H.

5. The method according to any of the preceding claims wherein the reaction mixture further comprises an additional reactant.

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*Sub 2*

*Sub 3*

6. The method according to claim 5, wherein the additional reactant is selected from the group consisting of amines, alcohols, thiols, hydride ions, alkenes, alkynes, boric acids, boronic acids, carboxylate ions, malonate-type ions, enolate-type ions, azide ions, cyanide ions, halide ions, phosphines  $R_3P$  wherein  $R_3$  is aryl, heteroaryl and alkyl, metal-organic compounds.

7. The method according to claim 2, wherein M is selected from Mo, W, Mn, Cr, and Co.

8. The method according to claim 2, wherein the metal carbonyl is selected from the group consisting of  $Mo(CO)_6$ ,  $W(CO)_6$ ,  $Mn_2(CO)_{10}$ ,  $Cr(CO)_6$ , and  $Co_2(CO)_8$  or derivatives thereof.

9. The method according to any claim 2, wherein the metal carbonyl is used in amounts of 0.1 to 10,000,000 molar equivalents.

10. The method according to claim 3, wherein the formamide is used in amounts of 0.1 to 10,000,000 molar equivalents.

11. The method according to claim 1, wherein the energy source raises the temperature of the reaction mixture to at least 100°C.

12. The method according to claim 1 wherein the metal catalyst is selected from the group consisting of  $Pd^0$ ,  $Pd^{II}$ ,  $Pd^{IV}$ ,  $Pt^0$ ,  $Pt^{II}$ ,  $Pt^{IV}$ ,  $Ni^0$ ,  $Ni^I$ ,  $Ni^{II}$ ,  $Ni^{III}$ ,  $Rh^0$ ,  $Rh^I$ ,  $Rh^{II}$ ,  $Rh^{III}$ ,  $Co^0$ ,  $Co^I$ ,  $Co^{II}$ ,  $Co^{III}$ ,  $Ir^0$ ,  $Ir^I$ ,  $Ir^{II}$  and  $Ir^{III}$  species.

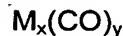
13. The method according to claim 1, wherein the metal catalyst is present in molar equivalents of at most 0.9.

14. The method according to claim 1, wherein the non-metal substrate is covalently bound to a polymer.

15. A method of preparing a chemical library which comprises

preparing a reaction mixture containing a non-catalysing solid or liquid CO releasing compound, a non-metal substrate compound and a metal catalyst; and exposing the reaction mixture to an energy source to release carbon monoxide from the CO releasing compound, wherein the carbon atoms of the released carbon monoxide form a bond with a non-metal substrate compound.

16. The method according to claim 15, wherein the non-catalysing CO releasing compound is a metal carbonyl of the general formula I,



wherein M is a metal, x is an integer, y is an integer, and wherein the metal carbonyl is not complexed with or bonded to the non-metal prior to preparing said reaction mixture.

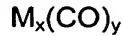
17. The method according to claim 15, wherein the non-catalysing CO releasing compound is a formamide of the general formula I,



wherein R<sub>1</sub> and R<sub>2</sub> independently can be H, or an optionally substituted, linear or branched alkyl, aryl or alkylaryl group.

18. The method according to claim 1 or 15, wherein the energy source is selected from the group consisting of thermal energy, sonic energy, ultraviolet irradiation, microwave energy, and radiofrequency.

19. A kit for organic reactions including CO as reactant comprising a one or more solid or liquid CO releasing compounds, selected from metal carbonyls of the general formula I,



wherein M is a metal, x is an integer, y is an integer, or formamides of the general formula II,



~~wherein R<sub>1</sub> and R<sub>2</sub> independently can be H, or an optionally substituted, linear or branched alkyl, aryl or alkylaryl group.~~

20. The method according to claim 7, wherein M is Mo or Cr.
21. The method according to claim 20, wherein M is Mo.
22. The method according to claim 8, wherein the metal carbonyl is Mo(CO)<sub>6</sub>, or Cr(CO)<sub>6</sub>.
23. The method according to claim 22, wherein the metal carbonyl is Mo(CO)<sub>6</sub>.
24. The method according to claim 9, wherein the metal carbonyl is used in amounts of 0.1 to 1000 molar equivalents.
25. The method according to claim 24, wherein the metal carbonyl is used in amounts of suitably 0.20 to 100 molar equivalents.
26. The method according to claim 25, wherein the metal carbonyl is used in amounts of 0.25 to 5 molar equivalents.
27. The method according to claim 26, wherein the metal carbonyl is used in amounts of 0.3 to 0.6 molar equivalents.
28. The method according to claim 10, wherein the formamide is used in amounts of 1 to 1,000 molar equivalents.
29. The method according to claim 28, wherein the formamide is used in amounts of 1 to 100 molar equivalents.

30. The method according to claim 29, wherein the formamide is used in amounts of 5 to 50 molar equivalents.
31. The method according to claim 11, wherein the energy source raises the temperature of the reaction to at least 130°C.
32. The method according to claim 31, wherein the energy source raises the temperature of the reaction to at least 150°C.
33. The method according to claim 13 wherein the metal catalyst is present in molar equivalents of at most 0.5.
34. The method according to claim 33, wherein the metal catalyst is present in molar equivalents of at most 0.5-0.02.
35. The method according to claim 18, wherein the energy source is preferably thermal energy or microwave energy.
36. The method according to claim 35, wherein the energy source is microwave energy.